SCIENCE

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THE OUTLOOK FOR APPLIED ENTOMOLOGY.[1]

GENTLEMEN,— You have made it the duty of your presiding officer to give an annual address,— a duty the less easy to perform for a new organization than for one which has a history behind it, and not facilitated by my absence in Europe at the time of your organization.

I had thrown together a sort of *résumé* of the results obtained during the year in economic entomology, more particularly by the entomologists of the different State stations, in the belief that this would be one of the most appropriate themes to present; but when I learned, from his circular of Sept. 15, that Professor Forbes intended covering substantially the same ground, and that it was expected of him as one of his duties as chairman of the committee on entomology of the Association of Agricultural Colleges and Experiment Stations, it became evident that what I might present in that direction would be substantially anticipating and repeating what we may expect and hope to hear from him. I will endeavor, therefore, to touch upon a few matters unconnected with station work.

Some Results from the National Department at Washington.

The hydrocyanic-acid gas treatment against scale-insects is becoming more and more common in California, and has to a certain extent superseded the use of washes, especially against the red scale (*Aspidiotus aurantii*). This is largely due to the fact that recent experiments, carried on through Mr. Coquillett, have resulted in a great cheapening of the process. The expense has been reduced to one-third, and the bulky machinery mentioned in my report for 1887 has been for the most part dispensed with. It has also been found that the use of the process at night is safer and more beneficial, in that it lessens the effect of the gas upon the foliage.

The repeated importation of scale-insects from Florida into California has attracted much attention. The species concerned are principally the purple scale (*Mytilaspis citricola*), the long scale (*M. gloverii*), and the chaff scale (*Parlatoria pergandei*). The fact that these insects must have been repeatedly imported into the State in past years without obtaining a foothold, has been used as an argument against a quarantine, and a great deal of discussion on the subject has been had in the California papers. From my own observations in the State, I am convinced, that, where the proper conditions of shade and moisture are obtained, there is no reason why these scale-insects should not obtain a foothold, but that they will probably die out in the hotter, dryer, and less shaded localities. An agent who was sent to Pomona to investigate certain newly planted orange-groves of Florida trees found, that while the trees were planted a year previously, and had been dipped, according to custom there, in a caustic solution, every tree examined by him bore a few specimens of the purple scale. The excitement on this subject in California has been fostered by the claims of rival nurserymen engaged either in the importation of Florida stock or dealing in varieties grown at home, and with so many contrary claims from persons prejudiced by their business interests, it is difficult to extract the truth. A rigid quarantine, not absolutely prohibitive, were wisest, for great injustice might be worked by absolutely prohibitive restrictions. Careful inspection and thorough treatment, if they could be guaranteed, would prove an effective safeguard, but it were unsafe to trust to them without rigid quarantine.

I have commenced a series of experiments upon the black scale (*Lecanium oleæ*), a species which, ordinarily occurring upon the olive, has long damaged citrus fruits in California. The horticulturist of the Wisconsin station, Mr. E. S. Goff, has modified the Nixon pump by adding a tube, so that kerosene may be drawn from one receptacle and a mixture of soap and water from another, thus forming a mechanical mixture in the act of spraying. This modification, at the request of Professor Henry, I have had tried in this series of experiments, and, although it is too early to state the results, it may be said that so little time and labor are required in preparing a stable emulsion, that this mechanical substitute will probably not come into general use. In this connection it may be observed that the formulæ recommended by some of our most voluminous writers are very misleading, and are calculated to produce only a mechanical mixture more or less unstable. The use of kerosene, temporarily combined with water or soap suds by mechanical means, dates from many years back. It was a favorite remedy of my friend Thomas Meehan, who urged it in 1871 in the *Gardener's Monthly;* it was experimented with by others; and I used it successfully in 1872 against an undescribed *Lecanium* on Austrian pine, as also against *Aphides* on the place of Mr. Julius Pitman of St. Louis, and in 1874 and 1875 against the congregated young of the Rocky Mountain locust. But the true and stable kerosene emulsion which now forms one of the most satisfactory and widely used insecticides, and which requires two parts of the oil to one of the emulsifying agent, violently churned until a stable, butter-like emulsion results, was the outgrowth of my efforts in the investigation of the cotton-worm, the milk having been first suggested in 1878 by the late Dr. W. S. Barnard while working at Selma, Ala., and the most satisfactory formula in 1880, from experiments which I had continued over two years by Mr. H. G. Hubbard on orange-trees.

A locust outbreak of some interest has occurred in parts of Idaho and Utah, and has been investigated by Mr. Bruner,

[1] Address of Dr. C. V. Riley at the annual meeting of the Association of Economic Entomologists, Champaign, Ill., Nov. 11-14, 1890.

the Nebraska agent of the division. The species involved proved to be *Camnula pellucida*, which has overrun a strip of country a hundred and forty miles in length by from fifteen to thirty in width, commencing at a point about thirty miles westward of Soldier, Idaho, and extending east as far as East River and Birch Creek. The people in these sections are quite willing to do whatever can be done to destroy these insects, but they need instruction. The country has been largely settled since the publication of the early reports of the United States Entomological Commission, and the new settlers lack experience in dealing with locusts; for fifteen years make great changes in the rapidly growing West. I have therefore in preparation a bulletin treating of the several species of locusts which are responsible for these frequent scares, and which will include, at the same time, a summary of the practical portions of the earlier reports of the Entomological Commission on *Caloptenus spretus*, long since out of print.

The army-worm proved injurious in several localities during the past year, particularly in Maryland and Indiana. The Maryland occurrence is of considerable interest, owing to the fact that the preceding year was one of unusual precipitation; and the outbreak of the insect was due rather to the extremely mild winter, which prompted the constant growth and development of the hibernating larvæ.

The notices in *Insect Life* and the *Entomologists' Monthly Magazine* of the damage caused by a new bark-louse to the gardens of Alexandria, Egypt, have attracted considerable attention, and Mr. J. W. Douglas has described the new depredator as *Crossotosoma ægyptiacum*. A study of Mr. Douglas's description and figures has convinced me that this insect is an *Icerya*, and that its spread is greatly to be feared, judging from our experience with *I. purchasi*. Moreover, three additional species of this genus have been brought to my notice during the year,—one occurring in Mexico on grape-vine; another in Key West, Fla., upon roses and other garden plants; and the third in the Island of Montserrat, West Indies, upon the cocoa palm, the banana, and a species of *Chrysophyllum*. These interesting and injurious insects have been investigated, so far as could be done, by correspondence; and full descriptions, with figures, will be published in the forthcoming number of *Insect Life*.

The sugar-beet industry, after a quarter of a century's vicissitude, has begun a substantial and permanent growth, especially in Nebraska. It has been found that the crop is speedily attacked by insects; and Mr. Bruner, being advantageously located for work of this kind, has, during the past summer, paid some attention to the insect enemies of this crop, and has already a list of sixty-four species, most of them being leaf-eaters and such as are commonly found upon various allied succulent plants, one of the worst being the garden web-worm (*Eurycreon rantalis*).

The Hop Phorodon.

One of the most interesting facts of the year has been the occurrence of the hop-fly (*Phorodon humuli*) in the extreme North-west, especially in Oregon and Washington, so soon after my note of warning as to the danger of its introduction to the hop-fields of that section, and the need of precautionary measures that might prevent such a calamity. The soil and climate of southern Oregon seem particularly adapted to the growth of the hop, as it is already the leading crop in Lane, Marion, Polk, and other counties.

There can be no doubt about the species, because Mr. F. L. Washburn, the entomologist of the experiment station, has given it some attention; and I have also received specimens from him and from Mr. A. Todd of Eugene, Oregon, as also from Mr. Giles Farmin and Mr. G. M. Stratton of Puyallup, Wash.

Mr. Washburn, from the fact that it has been noticed that hops were sometimes not so much affected in the immediate vicinity of plum-trees as some distance away, and from the further fact that some of the growers reported that they never saw the insect on the plum, intimates that there must be a different state of affairs in Oregon, so far as the life cycle of the insect is concerned, from that which prevails in the Eastern States and in Europe. Absolute and experimental proof of facts obtained after long and persistent investigation should never be lightly questioned. It is by no means a common experience that hop-plants in the immediate vicinity of plum-trees are not more affected than, or as much as, others at a distance; and this may depend on the direction of the wind, or on local circumstances, or on the variety of plum, whether wild or cultivated. I have examined in vain certain cultivated plum-trees for evidence of *Phorodon*, whereas I have invariably found it upon other varieties in the same vicinity. *Phorodon humuli*, in common with all other aphidids, preferably chooses, when migrating, certain genial days, and often fills the air, flying great distances. In perfectly calm weather the migrants settle almost everywhere; but they are easily affected by the least breeze, and are wafted in different directions. The invasion of a hop-yard may be from plum-trees miles away to windward.

Phylloxera.

The grape *Phylloxera* has continued to attract the attention not only of most European governments, but also of those of Australia and New Zealand. It continues its spread in France, having at last invaded the more valuable champagne districts. The last report of the Superior Phylloxera Commission of that country shows that about 240,000 acres have undergone defensive measures, submersion being employed in 72,000, bisulphide of carbon in 145,000, and sulpho-carbonate of potassium in 23,000. The work is practically at an end in such departments as Hérault, Gard, and Gironde, where the American resistant vines have most effectually been used; while the wine-growers of Algeria, Spain, Italy, Portugal, Hungary, Austria, and Switzerland, are all battling against it, and are all more or less aided by their respective governments.

The advent of the insect in New Zealand has been the cause of much writing and of much legislation there, and the government has been quite anxious to get the best and latest information on the subject. There is very little that is available in the way of published experience in this country, as my Missouri reports are now very difficult to obtain. I would repeat here in substance what I have recently written to Mr. F. D. Bell, agent general at London for New Zealand, because the demand for the information is continuous, and our own people are to a great extent unfamiliar with the facts.

During the more than twenty years' struggle in France against the species, innumerable remedies have been proposed, most of which have proved to be absolutely valueless. A few measures have been devised, however, which, under proper conditions, give fairly satisfactory results. These consist in (1) methods which avoid the necessity of direct treatment, comprising the use of American stocks and planting in sandy soils; (2) the employment of insecticides (bisulphide of carbon, sulpho-carbonate of potassium, and the kerosene emulsion); and (3) submersion.

It was early found in the history of this *Phylloxera* that most of the cultivated varieties of American grape-vines, as also the wild species, resisted or were little subject to the attacks of the root form (*radicicola*) of the *Phylloxera;* although the leaf-gall form (*gallicola*), which in point of fact does little if any permanent damage, occurs in greater numbers on many of our wild and cultivated sorts than on the European grape-vines, which are all derived from the single species *Vitis vinifera*, and which are so exceedingly subject to the attacks of the root form. This fact was first noticed in France by M. Laliman of Bordeaux, and later by Gaston Bazille of Montpellier, and was independently proved on a more extended scale by my earlier investigations in the United States. The use of American stocks upon which to cultivate the susceptible European varieties has resulted in an enormous trade in certain American seeds and cuttings, and now supersedes all other methods against the *Phylloxera*.

It was my privilege and pleasure to spend a week in August, 1889, among the world-renowned Médoc and Sauterne vineyards of the Bordeaux district in France. Here, by virtue of the rich alluvial soil, and the ease with which the chief vineyards can be submerged, the *Phylloxera* has made slower headway, and the opposition to the use of American resistant stocks has been greatest. Yet they have finally vanquished prejudice, and are, either from necessity or choice, rapidly coming into general use. When I say "choice," I mean that even where the French vines yet do well, and the *Phylloxera* is kept in subjection by other means, it is found that greater vigor of growth and increase in healthfulness and yield of fruit result at once from the use of the American stocks.

Without going into a lengthy discussion of the subject of wild American species, those of practical importance to the grape-grower are the following: *V. æstivalis*, *V. riparia*, and *V. labrusca*.

The varieties derived from *V. æstivalis* are of value for their fruit as well as for their resistant qualities, and, being easily propagated from cuttings, they are very often used as stocks. The most important varieties are Jacquez, Herbemont, Black July, and Cunningham.

The varieties of *Vitis riparia*, both wild and cultivated, are, on account of their special fitness, almost exclusively employed in France as resistant stocks, for which they easily take first rank. The varieties used are (1) the wild forms; and (2) the cultivated varieties, Solonis, Clinton, and Taylor. Of the cultivated varieties, the Clinton was one of the first vines tried for this purpose, and has been extensively used with fair satisfaction. The Solonis now ranks above it, but is valueless for any other purpose on account of the acidity of its grapes. In California the Lenoir, Herbemont, and Elvira have been used, but late experience shows that the wild *Riparia* is most satisfactory there, as it is in France.

The different varieties of *Vitis labrusca* are less resistant to the *Phylloxera* than those above mentioned. Certain varieties have, however, been grown successfully in France, and of these the Concord has given much the best results; but others, Isabella and Catawba for example, succumb there to the root-louse, as indeed they do in many sections of this country.

Of the many valuable hybrids obtained from the American species of *Vitis* which are serviceable as stocks, the more important are the Elvira, Noah, and Vialla. The last named, perhaps, of all the resistant varieties, gives the greatest percentage of successful grafts, and is admirably adapted for grafting on cuttings.

Early in the study of the subject it was found that the nature of the soil has a very marked influence on the success of the different stocks. The subject has been now quite fully investigated in France, and the latest researches are formulated by the Experimental School at Montpellier in the statement quoted below, which will be of interest as giving the various classes of soils, together with the American vines best adapted to each.

"1. New deep fertile soils: *Riparia* (tomentous and glabrous), *Jacquez*, *Solonis*, *Vialla*, *Taylor*, and *Cunningham*.

"2. Deep soils somewhat strong, not wet: *Jacquez*, *Riparia*, *Solonis*, *Cunningham*, *Vialla*, *Taylor*.

"3. Deep soils of medium consistency, new and not dry in summer: *Riparia*, *Jacquez*, *Solonis*, *Vialla*, *Taylor*, *Black July*.

"4. Light pebbly soils, deep, well drained, and not too dry in summer: *Jacquez*, *Riparia* (wild), *Taylor*, *Rupestris*.

"5. Calcareous soils, with subsoil shallow or granitic: *Solonis*, *Rupestris*.

"6. Argillaceous soils, white or gray: *Cunningham*.

"7. Argillaceous soils, deep and very wet: *V. cinerea*.

"8. Deep sandy fertile soils: *Riparia* (wild), *Solonis*, *Jacquez*, *Cunningham*, *Black July*, *Rupestris*.

"9. Light pebbly soils, dry and barren: *Rupestris*, *York*, *Madeira*, *Riparia* (wild).

"10. Deep soils with a tufa base and salt lands: *Solonis*.

"11. Soils formed of *débris* of tufa, but sufficiently deep: *Taylor*.

"12. Ferruginous soils, containing red pebbles of silica, deep and somewhat strong, well drained but fresh in summer: all the varieties indicated, and in addition *Herbemont*, *Clinton*, *Cynthiana*, *Marion*, *Concord*, *Herman*."

The accompanying table from the last report of the Superior Phylloxera Commission indicates better than words can tell the steady growth in the use of the American vines: —

Years.	American Vines Covered. Acres.	Departments.
1881	22,000	17
1882	42,700	22
1883	70,000	28
1884	131,909	34
1885	188,200	34
1886	276,900	37
1887	413,700	38
1888	536,900	43
1889	719,500	44

On the subject of direct remedies the value of the kerosene emulsion for this purpose has not been properly realized in France because of the relatively high price of petroleum in her grape-growing *départements*. A series of experiments which I made in 1883 showed conclusively its great value for this purpose, as it not only destroys the insect in all stages, but also stimulates root-growth.

In this connection I have recently had a series of experiments made through Mr. Albert Koebele's agency, in the Sonoma valley, California, to ascertain the effect upon the *Phylloxera* of certain of the resin-washes which proved so

valuable when used against the fluted and other scale-insects. The results have been quite encouraging, and the experiments have already shown that in the use of these washes we have a valuable addition to the underground remedies. Soaps were made by the use of bicarbonate of soda, sal soda, and caustic soda, each mixed with resin. In the earlier experiments the earth was removed about the base of the vine to a depth of six inches and for a diameter of four feet. Ten gallons of the mixture were poured into each hole, and found to penetrate from twelve to sixteen inches or from eighteen to twenty-two inches from the original surface of the ground. Most of the insects, as also the eggs, were destroyed to a depth of sixteen inches. In the later experiments the holes were made only about two feet in diameter; and nearly if not quite the same results were obtained with half the amount, or five gallons of the mixture. The plan which I have previously adopted for the application of insecticides to underground insects, of washing the mixture in with pure water, was tried with good success. Soon after the first application, five gallons of water were added, and five gallons more the following day. This would indicate that in the spring, when rains are frequent (occurring almost every day) in the Sonoma valley, only a small amount of the mixture need be applied, and the rains will do the rest, as examination has shown that up to a certain point each application of water intensifies and extends the action of the original insecticide. The best soap was made with bicarbonate of soda; but the results of that made with caustic soda are so little inferior, while the price is so much less, that the caustic soda and resin soap mixture is the one which I would recommend. The formula which was found preferable is as follows: caustic soda (77 per cent), five pounds; resin, forty pounds; water to make fifty gallons.

The soda should be dissolved over a fire in four gallons of water, then the resin should be added and dissolved. After this, the required water can be added slowly, while boiling, to make the fifty gallons of the compound. To this water may be added at the rate of nine gallons for one, making five hundred gallons of the dilute compound, sufficient for one hundred large vines, at a cost of only eighty-four cents, or less than a cent a vine.

Considering the effective way in which the ravaged vineyards of France have been and are being redeemed by the use of resistant American stocks, and considering the efficacy of some of the direct remedies discovered, it is passing strange that no disposition has ever been made of the premium of 300,000 francs offered in the early history of the trouble by the French Government. It cannot be awarded to any one person, but should be distributed among those whose labors and discoveries resulted in the several feasible and satisfactory methods of coping with the insect.

Introduction of Parasites and Predaceous Species.

The success which has attended the introduction from Australia of *Vedalia cardinalis* has been phenomenal. Indeed, few who have not kept in knowledge of the reports and the actual condition of things can appreciate the remarkable character of the results, not only because of the brief period required therefor, but because of the thoroughness of the work of the little ladybird, and the moral and financial benefit too range-growers which has followed in its wake.

The striking success of the experiment has served to fix attention not only of entomologists, but of fruit-growers and farmers, to this mode of dealing with injurious insects; and there is no question but that the cases in which the experiment may be more or less successfully repeated are numerous. Let us hope, therefore, that the moral effect will be as great as its practical effect in opening up means and ways in the future, as it should serve to remove the disposition to deride any expenditure having such results for its object. Many fears have been expressed, lest, after sweeping off the *Icerya*, the *Vedalia*, being so far as we now know confined to that species for food, should perish, and that the *Icerya*, preserved in some restricted places undiscovered by its enemy, would again multiply and become destructive. I firmly believe what I wrote in my last annual report as United States entomologist: viz., —

"We may hardly hope, however, that the last chapter in the story is written. On the contrary, it is more than probable, and in fact we strongly anticipate, that the *Icerya* will partially recuperate; that the *Vedalia* will, after its first victorious spread, gradually decrease for lack of food; and that the remnants of the fluted scale will in the interim multiply and spread again. This contest between the plant-feeder and its deadliest enemy will go on with alternate fluctuations in the supremacy of either, varying from year to year according to locality or conditions; but there is no reason to doubt that the *Vedalia* will continue substantially victorious, and that the power for serious harm, such as the *Icerya* has done in the past, has been forever destroyed. We have learned, also, that it will always be easy to secure new colonizations of the *Vedalia* where such may prove necessary, or even new importations should these become desirable."

During the year I have endeavored to return the favors received from Australia and New Zealand by sending there some of the natural enemies of the codling-moth; and from last accounts, though jeopardized by the action of the custom-house authorities, the experiment promised success so far as a species of *Raphidia* from California is concerned. I have also endeavored to introduce some of the parasites which attack the Hessian-fly in Europe, and which do not yet occur in this country. These efforts have been made by correspondence; for you will be surprised to learn that the restrictive clause in the appropriations to the Department of Agriculture for entomological work, which limits travelling expenses to the United States, is still maintained in the face of the *Vedalia* experience, where, by the expenditure of fifteen hundred dollars, many millions were saved. The maintenance of this restricting clause in the last appropriation bill, under these circumstances, is a travesty on legislative wisdom, and all the more remarkable because done by the Senate, in opposition to the House and the recommendations of both the secretary and assistant secretary of agriculture.

While there is much to be done in this direction in future, I cannot let this occasion pass without giving a note of warning. Success will only come in any particular case when exact knowledge is first obtained, and the most thorough scientific methods are then adopted; and we cannot too severely condemn every thing that savors of buncombe and ignorance. During the year, the press of the country has prominently heralded the fact that a gentleman from San Francisco, especially charged to study certain entomological matters in the East, found, while in Washington, the two-spotted ladybird (*Coccinella bipunctata*) feeding on "the spotted *Aphis*" right under the windows of the Division of Entomology of the Department of Agriculture, the inference intended being that the entomologist and his assistants were ignorant of the circumstance. Indeed, a writer in one of the California papers of recent date announced this dis-

covery under the sensational heading "Another Good Bug. — The Woolly Aphis has found its Sedan." How supremely ridiculous this sort of thing appears to the well-informed entomologist I need not tell you, but it may be well for the information of the public to say (as I have not alluded to the matter elsewhere) that a number of different species of ladybirds feed upon the woolly *Aphis*, and that it is a rule with the insects of this family not to be select as to the particular aphid they prey upon. *Hippodamia convergens* (the species referred to as the Sedan of the woolly *Aphis*) feeds, over nearly the whole extent of the United States, upon this particular *Schizoneura*, among others; and the fact that both the species referred to feed upon various *Aphides* is well known. That one of the species is also common upon the Pacific coast, and that its being carried there from the East is like "carrying coals to Newcastle," may not, however, be so generally known. All such efforts as this, carried on by persons unfit, from want of any special knowledge, for the mission, must invariably do harm, not only because of the negative results which follow, but because of the lack of confidence in such work which they will engender in the minds of our legislators.

I should not think of holding any one responsible for newspaper paragraphs; but in this case the party has substantially confirmed them in statements over his own name, and in interviews which (as announced) he has himself revised.

Method of using Bisulphide of Carbon against Grain Weevils.

The use of bisulphide of carbon against different insects attacking stored grain has greatly increased in this country since I first recommended it some thirteen years ago.[1] There is, however, considerable diversity in the methods of using it; and the recommendations of some of our writers have evidently been made with no sense of the fact that the fumes are heavier than air, and descend rather than ascend. Professor A. H. Church, in a recent number of the *Kew Bulletin*, records that he found that a pound and a half of the bisulphide is enough to each ton of grain. He advises that it be applied in the following way:—

A ball of tow is tied to a stick of such a length that it can reach the middle of the vessel containing the grain. The tow receives the charge of bisulphide, like a sponge, and is then at once plunged into the vessel and left there, the mouth of the vessel then being tightly closed. When necessary, the stick may be withdrawn and the charge (of one ounce to a hundred pounds) may be renewed.

The action of carbon bisulphide lasts, in ordinary cases, six weeks, after which period a fresh charge is required. The bisulphide does no harm to the grain as regards its color, smell, or cooking properties; and the germinating power of most seeds is not appreciably affected, provided that not too much is used, nor its action continued for too long a period.

The assistant director of agriculture of Burmah is reported to have used naphthaline instead of bisulphide in the following way, but I should not expect any thing like as good results from the naphthaline as from the bisulphide.

A hollow bamboo cylinder an inch and a half in diameter, with a stick fitted into the cavity, is pushed down to the bottom of the bin. The stick is then withdrawn, and a few teaspoonfuls of naphthaline powder is poured into the bamboo, which is then drawn out, leaving the naphthaline at the bottom of the bin. If the bins are very large, this should be done once to every ten feet square, and the application should be repeated every fifteen or twenty days.

[1] Farmers' Review (Chicago), March, 1879.

Insecticide Machinery.

A profitable hour might be devoted to the subject of insecticide machinery, but I must content myself with a few words. At a trial of such machinery at the Mareil-Marly vineyards during the late Paris Exposition, I had an excellent opportunity of witnessing the latest advances made in France in this direction; and it was extremely gratifying to note, that, with whatever modification of the power employed (and many of the machines were very ingenious), all other forms of spraying-tip had been abandoned for vineyard purposes in favor of modifications of the Riley or Cyclone nozzle. The superiority for most practical purposes, of the portable knapsack pumps of V. Vermorel of Villefranche (Rhône), France, was sufficiently evident. M. Vermorel has identified himself with the regeneration and improvement of French grape-culture in many directions, and is, withal, an enthusiastic student of insect-life. I spent a very profitable day with him last year both at the factory and at his home, where he has established a virtual experiment station in the midst of a fine vineyard on American roots, and with every facility for various fields of investigation, none of which are deemed more important than the work in entomology; for he fully realizes how much there is yet to learn of some of the commonest insects destructive to the vine, even in an old country like France. But in no direction has he accomplished as much good as in his work with insecticide and fungicide machinery. His sprayer with independent pump, his diaphragm pump (L' Eclair), and his reservoir with suction and force pump, are all admirably adapted for the purpose they were invented for, and may be obtained in France at a cost of from five to seven dollars, which is tripled before reaching this country, thanks to our present tariff system.

The Galloway Sprayer.—The last number of the *Journal of Mycology*, the serial publication of the Division of Vegetable Pathology of the Department of Agriculture, gives full description, with figures, of a knapsack spraying-apparatus for which the special merit claimed is cheapness.

The combination of a suction and a force pump with knapsack-reservoir has been frequently made in France, as illustrated by the apparatus styled the "Cyclone" of Vermorel; the Japy, Vigeroux, Nougès, and Perrin sprayers; and the sprayer of the society "L' Avenir Viticole." A number of pumps manufactured in this country of this style were mentioned or described in the "Fourth Report of the United States Entomological Commission." These, in general, are much inferior to the French pumps named, which are, however, modelled after those earlier and cruder forms. There are a host of other French knapsack spraying-machines, which differ from those mentioned by propelling the liquid by means either of air-pumps, diaphragm-pumps, or devices in which the pump is attached to the reservoir by means of a rubber hose.

In 1888 Mr. Adam Weaber of Vineland, N.J., brought out the Eureka sprayer, a very serviceable knapsack pump modelled after the French machines. The French sprayers will cost, including duty, shipping, etc., from eighteen to twenty-five dollars; the Weaber sprayer is sold for twenty-one dollars, which is but little more than the cost of manufacture; Professor Galloway's machine is sold for fourteen dollars, or from a fourth to a third less than the Weaber or the French sprayers.

In the first announcement of this pump in No. 1, Vol. VI.,

of the publication cited, and in the later full description, no statement is made of the indebtedness of the inventor to these older machines, except in the case of the original description of the lance and nozzle (*op. cit.*, vol. v. No. 2), where credit is given. This naturally gives the impression that the apparatus is novel in many or all of its features.

When compared with the French machines, the following facts become apparent:—

(1) The reservoir is practically identical with that of the Vermorel, Japy, and other French machines, and the opening for introducing the liquid with strainer and lid presents no new features.

(2) The pump is an ordinary double-cylinder (or hollow piston) force-pump, the hollow piston furnishing an air-chamber which causes the liquid to be forced out in a continuous stream.

(3) The lance and nozzle combination consists of the Riley nozzle fitted to a lance, and provided with a degorging apparatus, which also acts as a stop-cock modelled exactly after Raveneau's apparatus, and is practically the same as the Japy degorger and stop-cock, except that the action is reversed. In the latter (see *Insect Life*, vol. i. p. 265, Fig. 61) the spring normally closes the discharge orifice; and in the former the orifice is normally open, and is closed by the action of a lever in the spring.

That this modification of the foreign knapsack sprayers will prove a serviceable one for vineyard work, and by reason of its cheapness and availability come into general use, I have little doubt.

Strawson's Air-Power Distributer.

A new and distinct type of insecticide machine, the invention of Mr. G. F. Strawson, Newbury, Berks, England, has attracted no little attention, and has received numerous awards during the past two years at various agricultural shows in England, and has been very favorably noticed and recommended by competent judges. It was shown at the late Paris Exposition, and was thoroughly tested before a select jury, from which it received the highest praise, and was awarded a gold medal. I had occasion to study it thoroughly not only at Paris, but at the Royal Show at Windsor, and am under obligations to the inventor for courtesies and facilities afforded.

It will have, in common with all the heavier and more expensive machines, to contend with the more popular and less expensive portable machines. It has many advantages in the control of the volume and character of what it disseminates, and, with some modifications and adaptations for nether spraying, it would prove extremely serviceable in extensive fields of any crop that needs such spray, and where the rows are relatively straight and the plants low. The principle also is a good one, and practicable, with modifications, for many other uses.

The machine is called the "Strawsonizer," and is a pneumatic or air-blast distributer, and may be adapted to a variety of uses, such as broadcast sowing of grains, distribution of fertilizers or of disinfectants in cities, and of dry or liquid insecticides.

The machine is light, simple in construction, and easily operated by one man; the larger sizes being drawn by one horse, and the smaller by hand-power. It is constructed largely of wood, and is mounted on two iron wheels. The distributing power is obtained by a blast of air produced by a revolving fan worked by the travelling-wheels of the machine.

The essential part consists of a suitable receptacle or hopper, either for liquid or dry substances, from which the material is fed automatically and regularly to the blast generated by the revolving fan, the whole operated by suitable gearing. A receptacle for either dry or liquid material can be employed in connection with suitable nozzles or deflecting devices on all the machines; so that, with practically one apparatus, all the kinds of work indicated above can be accomplished.

For solids a metal spreader is used, while for liquids nozzles of the direct discharge type, but variously arranged to suit different requirements, are employed.

Very uniform and rapid work may be done with this machine in broadcast sowing of wheat, oats, and smaller seeds. These are distributed with great regularity over a track from eighteen to twenty feet wide, giving a rate of from thirty to forty acres per day. It is especially serviceable as a distributer of fertilizers (phosphates, nitrate of soda, lime, etc.) and all insecticide powders, which latter may frequently be applied in connection with the former substances.

Liquid insecticides are distributed broadcast at a rate of from one gallon upwards per acre, and, by the action of the powerful blast of air, are broken up into a fine mist, which spreads uniformly to a width of twenty feet. Nozzles for upright or lateral spraying would adapt the machine for work in hop fields or orchards.

A patent for the apparatus has recently been taken out in this country; but its manufacture here has not, so far, been inaugurated.

The one-horse-power machine for broadcasting grains, fertilizers, and either solid or liquid insecticides, with suitable receptacles and nozzles, is retailed in England for £30 sterling, or $150. If fitted with special nozzles for vertical work, £2 extra are charged. Hand-power machines are sold for £12 and £14. These prices would be even greater in this country, and would doubtless interfere with its adoption were it not that it combines the other advantages indicated.

(To be continued.)

THE CORK-INDUSTRY IN SPAIN.

THE cork-tree is found in Spain in great abundance in the provinces of Gerona, Cárceres, and Andalusia, especially in the provinces of Huelvas, Seville, and Cadiz, and, although in less quantity, in the provinces of Ciudad Real, Malaga, Cordoba, Toledo, and some others. The United States consul at Barcelona says, that, according to a calculation made by the administration of forests the extent of cork-forests in Spain is about 255,000 hectares (a hectare is equivalent to 2.47 acres), distributed as follows: 80,000 in the province of Gerona, 45,000 in Huelvas, 32,500 in Cárceres, 28,000 in Seville, 20,000 in Cadiz, 11,500 in Ciudad Real, and 9,500 in Cordoba. In the localities exposed to the north the cork is better than in those exposed to the south, and it is seldom found in calcareous soil, preferring always that of the felspar, this being found principally in the province of Gerona. It grows and develops in ground of very little depth, and sometimes in very stony ground. The leaves of the cork-tree are oval oblong or elongated oval, frequently toothed, and the teeth jagged; length, from three to five centimetres, and width from one and a half to two. The roots are strong, and spread considerably, and are frequently to be seen on the surface of the ground. It sometimes happens that the portion of root exposed to the air produces cork, while that which is buried produces scarcely any. The most common practice is to cultivate the plant by sowing, which is frequently done, especially in ground somewhat manured, making alternate furrows with vines. Up to their twentieth or twenty-fifth year the ground is cultivated as if it were a vineyard, rooting up at that age the vines on account of producing less fruit, and also on account of the cork-trees being fairly grown up, and no

longer requiring the shelter of the vines. The barking of the cork may be effected when the plant has acquired sufficient strength to resist the operation, and the time chosen for this operation is in the summer. The cork of the first barking is called *corcho bornio, bornizo*, or virgin, and is not fit for making corks. The cork taken after the first barking is called *pelas*, or secondary cork. The method employed in Spain for this operation consists in the total barking of the trunk, and not partial barking, or barking one part of the year, and the remainder three, four, or five years later.

In proportion as the cork is taken from the tree, it is removed, and piled up in heaps. Sometimes the cork is cooked in the woods, but at other times this operation is effected in the caldrons that exist in the cork-factory. The slabs remain in boiling water during the space of one hour, this operation causing an increase of thickness (generally of one-fourth to one fifth), elasticity of the cork, and dissolution of tannin and other substances. The caldrons in which the cork is boiled are of copper, and are either cylindrical or rectangular. The boiling of the cork can also be effected by steam, for which purpose it is introduced into a wooden box lined on the inside with copper or zinc, which is filled with water and steam injected therein. The steaming of cork sometimes hardens it and makes it brittle. The loss of weight produced by boiling the cork varies between twelve and forty per cent.

In making corks it is necessary to take away the hard crust, or *raspa*, for which purpose a tool is used with a short handle and curved blade, called *doladera, raspador*, or *raspeta*. A workman can scrape from two to three square metres of cork daily, and the loss in weight of the cork by scraping is from twenty to thirty per cent. Scraping-machines are also used, two systems being employed, — the Besson and Tousseau. The former, propelled by steam, consists principally of horizontal spindles supplied with comb-like teeth, and turning with great velocity, at the rate of nine hundred revolutions a minute. The Tousseau scraper attacks the cork by means of a vertical iron shaft carrying several knives, whose edges are also vertical, and by the rotary movement of the shaft, giving fourteen hundred turns a minute, work like a brush. This machine is simpler than the Besson, and the slabs suffer less damage when worked by inexperienced workmen. Before cutting the slabs into strips, they are cooked for about half an hour, so as to facilitate the cutting, and piled up soon after in a damp place, so as to preserve the softness until ready to operate upon. The slabs are divided into three strips (*rebanadas*), the width of which is equal to the length of the corks, and in such a way, that, if the cork be placed in the position occupied by the slab on the tree, they would have their fibres running alike. The workmen obtain or cut the strips by means of a knife with flat surface and curved edge, called *cuchilla de rebanar*. The strips are then made into squares by means of the *cuchilla*. They then have the edges cut, and, thus prepared, they are ready to be made into corks. This and the preceding operation are the most difficult of the cork-industry, requiring great intelligence if the slabs and strips are to be cut to the best advantage.

In the manufacture of the corks, the squares made into octagons first pass into the hands of the workman, who is furnished with a knife composed of two pieces, — one of them similar to an ordinary knife, and the other a blade the edge of which fits into the first. Consul Schench says that only by seeing is it possible to form an idea of the rapidity with which these men take hold of a square, and from it make a cork. They hold the knife by a small iron catch to the table in front of them, and, giving to the square a circular movement, the result is that the cork is made in a few seconds. The squares are usually boiled for about a quarter of an hour. They are then deposited in a cool place, and four or five days after they are sorted, and kept damp until required. The amount which the workmen receive for cutting 1,000 corks varies from .75 to 4 *pesetas* according to the kind of workmen (the *peseta* is equivalent to about 9½ pence).

Machines are also employed to make corks; and all consist, at the base, of a knife, the blade of which is placed horizontally, joined generally to a piece of wood, and to which a backward and forward movement is given similar to that of a carpenter's plane. In moving, the knife turns the square cork, which, being attacked by the knife, takes off a strip of cork more or less thick, according to the distance from the axle of the cork to the edge of the knife. If these are parallel, the result is that the cork is cylindrical; and if not, it becomes conical. The cork-maker or workman has a large basket, or several of them, in which he places the corks according to size or quality; but this first classification is not sufficient, and the corks are placed upon a table, the back part of which is furnished with boxes the front part of which are open to the operator. To classify the corks according to size, they also employ wooden boxes, the bottoms of which can be taken out or put in, having a kind of grating of wood somewhat resembling Venetian blinds. The boxes are suspended by ropes to the ceiling, and the workman gives it a swing backwards and forwards, by which the smaller corks drop out at the bottom. With this apparatus worked by one man, 100,000 corks are classified for their size in one day. The corks are washed in a solution of oxalic acid or bioxalate of potash. As soon as washed they are placed out to dry gradually in the shade, in order to enable them to retain the silky gloss which the cork has when it is damp. For packing, 30,000 corks constitute what is called a bale. For South America and Oceania, bales consisting of 5,000 to 10,000 corks are made, and for England the sacks or bales are made to contain 100 gross, or 14,400 corks for those of the larger size, and 150 gross for those of smaller dimensions. The greatest number of corks are manufactured in the province of Gerona; and the most important towns engaged in the industry are San Filieu de Guixols, Palafrugell, and Cassa de la Selva. The number of workmen engaged in the cork-industry in Spain is said to be not less than 12,000.

NOTES AND NEWS.

ACCORDING to M. Edouard Marbeau, in the *Revue Française de l'Etranger et des Colonies*, quoting from Professor Léon Le Fort, the following is the rate of increase of population in several European countries: for every 1,000 inhabitants there are born in Hungary 42 children; in Germany, 39; in England, 35; in France, 25. In 1778 the number in France was 38.4. At the present rate of increase, the population would be doubled in Saxony in 45 years; in England, in 52 years; in Prussia, in 54 years; in France, in 198 years.

— The Belgian consul-general at Singapore, in a report quoted in the English *Board of Trade Journal*, says that rubies and sapphires abound in the Siamese provinces of Chantaboun and Battambang. Several mines have been worked since a remote period by the natives, but for a long time they produced for the most part only stones of little value. It was in 1874 that the first mine of sapphires of good quality was discovered by a native huntsman in the environs of Chantaboun. The place was very difficult of access, so that the news of the discovery spread slowly. Rangoon being still at that time the nearest market to Siam for the sale of precious stones, the Burmans were the first to know of the existence of the new mine by the stones which were offered for sale at Rangoon. Some went there, and the large sums which they brought on their return from the sale of their produce brought about a movement of very active emigration for the same destination during the years 1878 and 1879. The new-comers discovered several mines as rich as the first. But there, as at Bantaphan, fevers made such sad ravages in the ranks of the workers, that in 1880 the number of arrivals decreased in considerable proportions; and at the present time the population of these mines, which once reached the figure of 10,000, consists of a few Pegu Toung-Thons, who can ward off better than other races the ills resulting from the terrible climate of the country. Rubies, onyx, and jades are also found in considerable quantities in the province of Chantaboun, but their quality leaves much to be desired. Battambang is as rich in precious stones as Chantaboun, and it is stated that recently diamonds have been found near the frontier of Cambodia; but the mines of this province are almost abandoned because of the insalubrity of the climate, and the want of protection for foreign workers

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

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THE AMERICAN HISTORICAL ASSOCIATION.

THE American Historical Association held its seventh annual meeting in Washington City, Dec. 29–31. Distinguished historians from all sections of the country were present. Among those in attendance, besides those presenting papers, were Professor G. Stanley Hall, president Clark University; Edward Eggleston, historian and novelist; Mrs. Martha Lamb, editor of the *Magazine of American History;* Judge Charles A. Peabody of New York; Senator George F. Hoar; Professors Monroe Smith and W. A. Dunning of Columbia College; Hon. George B. Loring; Paul L. Ford of Brooklyn; Professor H. B. Adams, Johns Hopkins University, and secretary of the association: Dr. Robert H. Landon of New York; Professor J. F. Jameson of Brown University; William B. Weeden of Providence, R.I.; Professor Barnes of Indiana University; Professor George E. Howard of the University of Nebraska; John A. King, president of the New York Historical Society; Jeffry R. Brackett, Ph.D., of Baltimore; G. Brown Goode, assistant secretary Smithsonian Institution; Professor D. R. Dewey, Institute of Technology, Boston; Professor John M. Vincent, Johns Hopkins University; and President W. W. Welling, Columbian University.

The inaugural address of Hon. John Jay, president of the association, was read by Hon. William Wirt Henry, Mr. Jay being unable to attend owing to an accident sustained some time since. Mr. Jay, in his paper, congratulated the association upon its prosperous condition, and spoke of the recognition by Congress of its national importance by its incorporation, and, in connection with the Smithsonian Institution, the generous privileges accorded to the association in regard to its collections, exchanges, and distributions of circulars.

The two other papers of the first session were in the field of Canadian history,— the one by Dr. J. G. Bourinot, clerk of the Canadian House of Commons, on "Canada and the United States from Historical Points of View;" the other by Benjamin Rand, Ph.D., on "The New England Settlements in Acadia." The papers of the second session lay in the general field of European history, and were as follows: "The Fate of Dietrich Flade," by Professor G. L. Burr, Cornell University; "The Theory of the Village Community," by Dr. C. M. Andrews, Bryn Mawr; "A Plea for Reform in the Study of English Municipal History," by Dr. Charles Gross; "Mirabeau's Speech of May 20, 1790," by F. M. Fling; "The Formation of the French Constitution," by Professor Adolphe Cohn, Harvard University; "Karl Follen and the Liberal Student Movement in Germany, from 1815 to 1819," by Professor Kuno Francke, Harvard University; and "Bismarck as the Typical German," by William G. Taylor.

American constitutional history was the topic considered at the third session. The following papers were presented: "How the Written Ballot came into the United States," by Douglas Campbell; "A Virginia Bill of Attainder: the Case of Josiah Philips," by Professor William P. Trent, University of the South; "Amendments to the Constitution of the United States," by H. V. Ames, Harvard; "Presidential Protests," by E. C. Mason, Harvard; "Responsible Government in Canada," by Dr. J. G. Bourinot; "Bills of Rights in State Constitutions," by Gen. R. D. Mussey, Washington, D.C.

The fourth session was devoted to American economic history. Five papers were presented, as follows: "The Historical Development of the Budget in the United States," by Dr. E. D. Adams; "The Yazoo Land Companies," by Dr. Charles H. Haskins, University of Wisconsin; "State Activities and Politics," by W. F. Willoughby, United States Department of Labor; "Slavery in New York," by E. V. Morgan; "Slavery in the District of Columbia," by Mary Tremain, paper read by Professor G. E. Howard.

The papers presented at the fifth session were "Raleigh's Settlements on Roanoke Island," by Stephen B. Weeks, Ph.D.; "Political Ideas of the Puritans," by Professor H. L. Osgood, Columbia College; "Co-operation among the State Historical Associations," by Gen. C. W. Darling, Utica, N.Y.; "The Organization of Historical Material," by W. H. Mace; "Is History a Science?" by Professor R. H. Dabney, University of Virginia; and "Importance of Geography to the Reader and Student of History," by President D. C. Gilman, Johns Hopkins University.

The papers read at the sixth and closing session were, "The Teaching of History," by Professor Edward Channing, Harvard University; "The Philosophical Aspects of History," by Dr. W. T. Harris, United States commissioner of education; "Webster's 7th of March Speech," by James Schouler; "The Border Land between the Archæologist and the Historian," by Professor O. T. Mason, United

States National Museum; and "The Expenditures of Foreign Governments in Behalf of History," by Professor J. F. Jameson, Brown University. Election of officers for the ensuing year, and report of committees, followed the reading of these papers. The following were the officers elected: president, the Hon. William Wirt Henry of Richmond, Va.; vice-president, James B. Angel, president University of Michigan; second vice-president, Henry Adams of the District of Columbia; secretary, Herbert B. Adams, professor of history, Johns Hopkins University; assistant secretary and curator, A. G. Clark; treasurer, C. W. Bowen of New York.

The committee on time and place of meeting reported Washington as the proper place for the next meeting, and during the holidays as the proper time.

The annual meeting of the association was in every way a success. There was a large attendance, the papers were interesting, and the discussions that were evoked, spirited and instructive.

THE AMERICAN ECONOMIC ASSOCIATION.

THE American Economic Association held its fourth annual meeting Dec. 26–30, in Washington. The association numbers between six hundred and seven hundred members, and includes among this number all the professors of political and social science in American colleges and universities, besides many others prominent in economic studies. The next number of its publications will complete its fifth volume of economic monographs.

The present programme embraced twenty-eight papers. President Francis A. Walker of the association delivered the opening address, in which he commented on the various phases of economic activity as exhibited in the increased attention given to economic study, in the rise of nationalism, the spread of the single-tax idea, the recent silver and financial disturbance, and in the change in the character of immigrants who have arrived on our shores within recent years.

Prominent among the papers read were the reports of the different committees, — on economic theory, by Professor J. B. Clark; on transportation, by Professor E. J. James; on statistics, by Hon Carroll D. Wright; and on technical education, by President Francis A. Walker. Other papers were, "The Concepts of Utility, Value, and Cost," by Professor F. H. Giddings; "The Term 'Wealth' in Economic Science," by Dr. Charles A. Turtle; "The Ethical Principle in Industrial Relations," by Miss Marietta Kies; "A Contribution to the Theory of Railroad Rates," by Professor F. W. Taussig; "The Relative Cost of Water and Rail Transportation," by Hon. George H. Ely; "The Relation of Railroad Passenger Traffic to Freight Traffic," by Professor E. J. James; "Street-Railway Statistics," by Charles H. Cooley, Esq.; "Statistics as a Means of Correcting Corporate Abuses," by Professor Henry C. Adams; "The Incidence of Local Taxation," by Professor Edwin R. A. Seligman; "Direct Taxation as a Source of Early Federal Revenue," by Dr. Roland P. Falkner; "Crooked Taxation," by Hon. T. G. Shearman; "The Educational Value of Political Economy," by Professor Simon N. Patten; "A Syllabus of Public Economy," by Professor William W. Folwell; "Land Transfer Reform, The Torrens System of Land Registration," by Professor J. W. Jenks; "The Third, i.e., the Social, Revolution," by Professor E. P. Cheney; "The Growth and Economic Value of Building and Loan Associations," by Hon. Seymour Dexter; "The Tailoring Trade and Sweating System," by Miss Katherine Coman; and "Girls' Boarding-Houses," by Robert Stein.

The last session was held jointly with the American Forestry Association, and included papers on "The Duty of Government in Regard to Forests," by Professor E. J. James; "The Present Condition of Forests on Public Lands," by Edward D. Bowers; "Government Forestry Abroad," by Gifford Pinchot; and "The Feasibility of American Forest Administration," by B. E. Fernow.

The meeting just closed was one of the most successful in its history. The following officers were elected for the ensuing year: president, F. A. Walker; first vice-president, Professor C. F. Dunbar of Harvard; second vice-president, Professor W. W. Folwell, University of Minnesota; third vice-president, Col. C. D. Wright, Department of Labor; secretary, Richard T. Ely, Johns Hopkins University; treasurer, Frederic B. Hawley, Esq., New York City; publication committee, Professor H. C. Adams, Professor J. B. Clark, F. H. Giddings, Professor F. W. Taussig, and Professor E R. A. Seligman.

EDUCATIONAL PROGRESS IN JAPAN.[1]

THE new era in the history of Japan was inaugurated by the opening of a few treaty ports on the Japanese coast to foreign trade in 1854, and was further marked by the restoration of the Mikado in 1868, and the abolition of feudalism in 1871. Since then immense strides have been made towards an assimilation of the old Japanese-Chinese world to Western civilization. The progress of Western political, commercial, and industrial ideas in Japan has been astounding. There have also been some changes in social life; and in matters educational a somewhat slower, but nevertheless remarkably steady, advance must be recognized. A complete system of primary, secondary, and university instruction has been developed. Primary instruction is imparted in the elementary and higher elementary schools; secondary instruction, in the ordinary middle and in the higher middle schools. In addition to these, there are several commercial schools in different parts of the country, and a higher commercial school in Tokio. There are also agricultural, military, and naval schools and colleges, and there is in the vicinity of Tokio a veterinary college and a forestry school of high standard.

Special attention has been paid to female education. There are two higher female schools in Tokio, in which very creditable work is already done. Great care is taken to teach European methods in the making of clothing, and in other forms of female manual labor, particularly in Tokio and in Kioto. There are, furthermore, a certain number of kindergartens, and two schools for European art and music. Teachers, both men and women, are trained in normal schools. There is one higher normal school in Tokio for the training of teachers for the normal and ordinary middle schools.

Japan, a country of thirty-six millions of inhabitants, possesses but one university, with about seven hundred students, the present Imperial University of Japan, which has sprung from several originally independent establishments. It comprises five faculties or colleges, — those of law, medicine, engineering, literature, and science. The engineering college, which for some time was under the direction of foreign professors, and the medical college, rank comparatively high. In the law college much attention is paid to political economy, and in the literature college to the teaching of history, philosophy, and German literature. Through the impulse given by Dr Riess, the German professor of history, a special historical department has been established in connection with the university, in which original investigations in Japanese history are conducted by an eminent Japanese professor. The scientific instruments and apparatus used in the engineering, science, and medical colleges, are of the best manufacture, and of latest European models. Recently there has been established in

[1] Abstract of a paper read at the Travellers' Club of the Johns Hopkins University, Oct. 10, 1890, by Dr. Emil Hausknecht of Tokio.

the university the so-called University Hall, which is intended to give students who have successfully gone through the college course an opportunity for more advanced work or for original research. Connected with the university is a library, an observatory, a botanical garden, a marine zoölogical station, and several hospitals. Some of the university buildings are built of brick, and heated by steam. The students live in frame dormitories, which are lighted by electric lights. There are a few other institutions which, in their highest classes, approach or equal the standard of the Imperial University; as, for example, the German Law School at Tokio, and the Doshisha, a school at Kioto, supported by American missionaries. Recently an attempt has been made at conducting a private university with a limited number of courses.

The professors in the university are either Japanese who have been trained abroad, or foreigners (German, English, American, French, and Chinese). The Japanese professors employ the Japanese language; the foreigners, generally their own language, with the exception of some of the German professors, who teach in English. In the medical college the language used, in addition to Japanese, is German; in the engineering, science, and literature colleges, English, with the exception of the special German literature course, in which German is spoken. In the law college there are three divisions,—the English division for English law, the French division for French law, and the German division for German law. In the same manner the higher middle school in Tokio is divided into special language departments. There is a German division subdivided into the German law division and the German medical division for those scholars who, when entering the university, intend to study medicine or German law; there is an English division with a great many subdivisions for the future students of the science, literature, or engineering colleges, and for the students of English law and political economy; and there is a French division for the future students of French law. It is evident that the language in which these scholars are particularly trained somewhat affects their spirit, and gives them a special propensity in favor of some foreign nation. Thus we see the young men who in the near future will constitute the intellectual leaders of Japan brought up in three different camps.

The higher middle school, which in the Japanese school system immediately precedes the university, and is indeed its fitting-school, is, according to the original conception, the continuation of the ordinary middle school. For practical reasons it has established preparatory classes of its own, also with several divisions, according to languages. Before entering these preparatory classes, the pupils generally lose much time in passing successively through a number of private schools. There are a great many of these private schools in Tokio, most of them without merit. In some of the worst the system of so-called "free students" prevails; that is to say, any student who pays an extra fee is at all times freed from the obligation of attending any of the courses chosen. Some of the best private schools in Tokio are conducted by teachers of the Tokio higher middle school. This school, as we have seen, is the preparatory school for the special university courses; so much so, that almost from the very beginning it subdivides into special departments.

This premature drill for some special branch is the outcome of the peculiar circumstances of Japan, which, in order to render possible and to fill the university, necessitated a too hasty mechanical training for the special university courses. It frequently involves the danger of preventing the pupils from acquiring a sufficient amount of thorough general knowledge and the all-round culture, which ought to precede the study of any special branch of knowledge. Indeed, a truly scientific standard can never be attained unless the spirit is strictly adhered to, which would found special attainments only on the basis of broad general knowledge. Moreover, the acquisition of broad general knowledge is particularly necessary for Japan in the present phase of her political development. Before the end of this year the first Japanese national parliament will have met. Will it be possible for the government to secure a sufficient number of men with wide knowledge and broad views to comprehend its enlightened and far-reaching projects of reform? A great deal of elementary work which, but for the hours taken by the special subjects, might have been accomplished in the higher middle school, has to be mixed up with more advanced studies. In the Japanese university it is particularly the lack of acquaintance with a sufficient number of the modern European languages which greatly interferes with satisfactory progress in true university work. The Japanese higher middle school system, with its premature special courses, leaves no time for entering into what is at the present time most essential for Japan; viz., the very spirit of Western civilization.

The difficulties which Japan, in introducing the Western learning into her middle schools, had to meet and to surmount were enormous. Not only the subject-matter, but also the methods of instruction, were entirely new. The greatest difficulty was to obtain teachers for the new learning. The need being so great, men who had often nothing but a glimpse of some single part of Western learning had to be employed as teachers. The fact that the new era demanded changes so numerous and so complete, that the demand for Western learning sprang up so rapidly, so unexpectedly, and so generally, had several drawbacks. The sudden desire for an adoption of the Western civilization involved a break with tradition. Tradition, being an important factor in education and social life, has always to be handled with particular delicacy and respect. The belief in a great many ideas which had before been considered sacred and venerable began to be shaken. Whereas, under the old *régime*, teachers embraced more or less the whole range of Sinico-Japanese knowledge, the teachers of the new era, as it has been impossible for them to acquire in the brief space of time a thorough knowledge of Western learning, generally know only the one subject which they have to teach, better than their pupils; while in the other subjects of Western learning the pupils are generally far ahead of them. Petitions of a whole body of pupils peremptorily asking the removal of such and such a teacher from their school, and strikes of pupils organized to enforce their will, are not unusual. Thus we see a great number of the young generation of the better classes in Japan growing up without true notions of authority and of submission. This, indeed, is a most deplorable state of affairs, both from a social and a political point of view.

However deficient the knowledge of the present generation of Japanese pupils in Western learning, there is, as has been pointed out above, a decided and steady progress to be noticed.

In a re-organized plan for the curriculum of a Japanese middle school which I was asked to prepare, I have tried to initiate the Japanese, as far as this can be done by school instruction, into the true spirit of Western thought. A translation of a passage from this plan may be here given: –

"The course of instruction is intended to bring about an amalgamation of Japanese-Chinese culture with the ideas of Western civilization, and proposes to bridge the mental abyss which still exists between Japanese and Europeans in their mode of feeling and thinking. The aim is to solve the problem of leading the pupils into the European range of thought, into the moral principles on which their law is based, and into the ethical views of life entertained by them; in short, into the spirit of Western civilization.

"The Western or European civilization is mainly a Romance-Germanic civilization, which may be divided into three groups: (*a*) the French branch of culture, (*b*) the German branch of culture, (*c*) the English branch of culture.

"The best introduction into the true spirit of these three forms of culture is by means of learning the respective languages. . . . Each one of these three groups forming the Romance-Germanic civilization comprises four elements: (*α*) the characteristic-popular element, (*β*) the Jewish-Oriental element, (*γ*) the old classic (Greek-Roman) element, (*δ*) the Christian element.

"The principal object of the course of instruction is to lead the pupil into the spirit of the first three of the above-named four elements of French, German, and English culture, by the following means:—

"Partly by instruction in history, partly through the reading-matter laid before the pupil in the study of the foreign languages, and partly through lessons in universal literature, in the introduction to the history of art, and in drawing.

"To the fourth element, Christianity, attention is given not only by way of historical instruction, but especially in the course of ethics, in such a measure that the pupil obtains an insight into the historic importance and the civilizing effects of Christianity, to the influence of which all the civilized Western nations owe their mental superiority over the other people of the globe."

To raise the standard of the university, I aimed at an elimination of the elementary studies which until now impeded true university work. These elementary studies were placed on the curriculum of the middle school, which was at the same time relieved from premature specialization. The former threefold division (English, German, French) was made to yield to one uniform course for every student. The endless variety of preparatory schools was reduced to two; viz., the elementary school and the new lyceum. The latter provides for an organically constructed course of studies extending over ten years. The student will now come to the university not only better prepared than formerly, and with a sufficient knowledge of three European languages, but also at a considerably earlier age.

Thus we see education in a steady progress in Japan. The many deficiencies and drawbacks which the hasty introduction of Western learning has brought about are the natural outgrowth of the circumstances. However deficient, the system of Western leaning employed until now has done good work, but it has outgrown itself with the advanced state of Western learning which the Japanese have now acquired. The fact that not only is the government aware both of the importance of education and of the deficiencies of the present system, but that so illustrious a body as the Gakushu Kwai in, that imitation of the Académie Française in Tokio, has given its attention to the educational question, justifies the hope that the steady progress made hitherto will be continued in the future.

DANGER FROM HEAVY SEAS.

THE following reports received by the United States Hydrographic Office illustrate the danger to vessels from the terrific seas that may be encountered during the winter storms in the North Atlantic. It may well be remembered that by heaving-to in time and riding out the worst of the storm, using oil to prevent seas from breaking on board, very serious damage may be prevented.

Second Officer Paterson of the British steamship "Vancouver" (Capt. Williams) furnishes the following additional details relative to the disaster that happened to that vessel on Nov. 7, eastward of the Strait of Belle Isle: "Toward midnight of the 6th the wind hauled west-north-west, bringing a tremendous sea along with it, which, with the head sea still running, caused a very treacherous cross-sea. We kept shipping heavy bodies of water, but without damage, the ship rising to the sea very nicely until 6 A.M., when two tremendous seas seemed to meet close aboard, and, the ship not rising to them in time, passed right over her, causing fearful havoc. The starboard breakwater on the forecastle-head, of heavy pitch pine, was torn out of the deck. The iron rails on the forecastle-head went also, and the light-tower was badly damaged. A large square iron companion on the main deck was bulged in, and an iron bulkhead crushed. The two iron doors of the alley-way were torn down, and the mass of water rushed through the alley and burst in the saloon-door, flooding the cabin. But the worst damage was caused on top of the saloon deck: the chart-house, wheel-house, and bridge were swept clear over the side, leaving only a portion of the weather side of the bridge, with the third officer, who was saved. The captain, who was in his room, and the quartermaster at the wheel, were both carried away with the wreckage. Another quartermaster was in the wheelhouse, and he was found lying across the brass pedestal of the steering-gear, very badly cut up. The lookout on the lee side of the bridge was jammed among the wreckage, and badly hurt; and two stewards, who were in the alley-way, were injured. The whole affair was over in a minute, so quickly that the captain and quartermaster had no time, probably, to realize what had happened."

Capt. Leask of the British steamship "Venetian" sailed from Liverpool on his westward trip Nov. 24. On Nov. 30, at 7.30 A.M. (about latitude 47° north, longitude 41° west), a mountainous sea came tumbling on board over the bows, rushing down the deck with tremendous force. It stove a hole in one of the bow plates above the main deck (breaking four angle-irons inside the plates), badly damaged three life-boats, carried away six ventilators, and stove in the engine-room skylight. One of the iron turrets, which protects No. 4 hatch, was torn from its fastenings and somewhat damaged.

The British steamship "Maryland" was in latitude 39° north, longitude 65° west, at noon, Greenwich mean time, Nov. 30. The wind increased from south-east during the day and night, and on the morning of Dec. 1 it was blowing with hurricane force. At 7 A.M. an enormous sea was shipped that ran as high as the fore-yard, carrying away the bridge, chart house, steering-gear, and all boats but one. Capt. Luckhurst was killed, together with the boatswain and cook; Chief Officer Lloyd was seriously injured; some 350 head of cattle were killed; and all nautical instruments, compasses, etc., were swept away. The only chart left after this terrible disaster was a copy of the "Pilot Chart," which was utilized in navigating the ship back to Delaware Breakwater.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

Copper Implements.

WHILE most of the implements made of native copper by the aborigines have probably found their way to the melting-pot, when discovered in recent years, a moderate number have escaped. Could full notes be secured of those found in the State of New York, it would possibly appear that they form a large proportion of all those known. Besides those of which I have merely heard, I have figured about thirty-five articles, two-thirds of them from this vicinity. Since I drew some of these for Dr. Abbott's "Primitive Industries," I have met with several well worthy of notice.

The largest of these is a long chisel, found near Oxford, Chenango County, N.Y., in 1856. Like most others, it is flattened on one side and ridged on the other, and of nearly uniform width throughout. It measures 14⅞ inches in length by 1¾ in breadth, and weighs 5½ pounds. This is the exact counterpart of a smaller one found here some years since. The latter is 11½ inches long by 1⅝ broad, and is 2 pounds 14 ounces in weight. Both are very fine examples.

I have seen several copper chisels with expanded edges, a number of spear-heads, knives, gouges, tubes, and nondescript articles. In no case here have I met with an implement perforated for attachment to a handle, and very few with a socket. A figure of one with both these has been sent me, the implement having been found at Cold Spring, on the Hudson River, and closely resembling some from the West. The most remarkable one with a socket, of which I know, recently came to light here. It is a massive implement, and the raised and angularly inclined edges seem intended to receive a handle, resembling some of the figures in Foster's "Prehistoric Races," but more No. 4 of Fig. 87 in Squier's "Ancient Monuments." That was one of a number from Brockville, on the St. Lawrence River. The raised edges are at the broad end, extending about one-third of the length on either side. Between these the general surface is depressed, rising by an abrupt shoulder 3¼ inches from the broad end. This shoulder is a little over a quarter of an inch high, but is sufficient to prevent the handle from slipping through the socket towards the narrower end. I am inclined to think the handle was sometimes removed, and the broad end used as a gouge, the ends being about equally sharp before they were hammered by some later hand. It is 10¼ inches long, 2¾ broad at the wide end, and 1⅝ at the narrower, weighing 3 pounds 2 ounces.

There is a class of recent copper articles found in New York which may have interest for some. Under this, for convenience,

I place those of bronze and brass, which have no distinction in form or age, but vary in composition. Bronze rings are among these, made by the French, and usually adorned with letters or symbols. Oval and angular medals are also found of a similar character, but of a higher type. Bracelets of copper wire, earrings of the same, pendants of rolled copper, and other things, belong to the same period. Until the close of the seventeenth century this material was commonly used in Indian trade and adornment. Early in the eighteenth silver ornaments came in, and have not yet quite passed away. Wherever found, it is safe to place silver articles in the latter period.

Among the recent copper articles found in the Iroquois district of New York, the flat and triangular arrow-heads of sheet copper may be noticed. They were probably made in the Indian towns, as shreds of this copper may still be found on New York Iroquois sites of the seventeenth century. The base is usually straight and narrow, and the two straight sides longer in proportion; but the arrow is not large, and may have a perforation or not. I mention these thus particularly, because they are precisely like those found with the Fall River remains, often termed "The Skeleton in Armor," and supposed by a few persons to be characteristic of the Northmen. The mode of attachment was the same in both cases.

Two recent writers have referred to this skeleton, with opposite views. Professor R. B. Anderson, in "America not discovered by Columbus," said this was found in 1831 (an error in date), and seems sure that the grave was that of a viking. He states that the metal and style corresponded with "old Northern armors" of the tenth century. On the other hand, Mr. J. W. Foster, in the appendix to his "Prehistoric Races," says that the skeleton "represents simply all that was mortal of a Narragansett Indian, rigged out in European trappings."

The valuable "Bibliography of the Pre-Columbian Discoveries of America," by Mr. P. B. Watson, appended to Professor Anderson's little volume, does not include one of the best and most accessible references. In his "Life of Brant," Col. Stone not only gives the Northmen credit for their discoveries, on p. 487 of his second volume, but adds a long note on the subject (pp. li.–lvii.) in the appendix. In this he not only gives a summary of the voyages of the Northmen, but a full account of the grave in the town of Fall River, Mass., opened in 1837. The body was in a sitting posture, the head being a foot below the surface of the ground. The grave was lined with coarse bark, the body enveloped in a coarse cloth made of finer bark. On the breast was an oval "plate of brass, thirteen inches long, six broad at the upper end, and five at the lower." Below this, and reaching around the body, was a belt of brass tubes, set upright and side by side. These thin brass tubes, 4½ inches long, and less than a quarter of an inch in diameter, were fastened together by sinews. Some arrows were in a bark quiver, parts of the shafts still adhering to some of the heads. "The arrows are of brass, thin, flat, and triangular in shape, with a round hole cut through near the base. The shaft was fastened to the head by inserting the latter in an opening at the end of the wood, and then tying it with a sinew through the round hole,—a mode of constructing the weapon never practised by the Indians."

Part of the flesh had been preserved by contact with the brass; and a figure of the skeleton, with the armor and arrows, was given. No surer test can be applied than to place some Onondaga or Cayuga arrows beside the latter; for like Iroquois arrows are still found, both free and attached to the shafts.

The breast-plate may simply have been the early and plain brass gorget, small specimens of which may still be found in Onondaga County, N.Y., but which was there replaced a little later by the large and highly ornamented silver brooches, some of which covered the entire breast.

I have seen a comparatively early Indian belt from Cayuga County which had parallel rows of very short brass tubes, though

of the same kind as those from the Fall River grave. In this case several series of perpendicular slits were made in a leather belt, and around the separated parts the brass was rolled, forming short tubes about a quarter of an inch long. Three remaining parallel rows of these were made, about the length of a tube apart. From some sites I have seen longer brass tubes, probably used as beads or pendants, though a number might easily have been arranged in a belt. The position of the body and the articles found at Fall River would place the burial there in the seventeenth century, though Longfellow's ballad has aided a different belief, not quite original with the poet.

Mohawk sites afford many curious articles, among which are thin plates of copper, one edge delicately serrated for a fine saw. These are recent, and were used in making combs and other bone and horn articles. I have not seen these elsewhere.

W. M. BEAUCHAMP.

Baldwinsville, N.Y., Dec. 30.

Harmotome from a Canadian Locality.

THE writer has recently observed harmotome in a specimen collected by Dr. A. C. Lawson (now in the museum of the Geological Survey, Ottawa) from one of the silver-bearing true fissure veins which cut the black argillites of the Animikie at one of the mines in the immediate vicinity of Rabbit Mountain, about twenty-two miles west-south-west of Port Arthur, in the district of Thunder Bay, Lake Superior. The crystals, twins of the usual form, are not more than four millimetres in length, and are implanted for the most part on calcite. The associated minerals are purple fluorite, pyrite, and another sulphide not yet fully determined. It may be of some interest to add this, the first recorded occurrence of the mineral in Canada, to the few on record for North America of this interesting mineral. A further notice will shortly appear.

W. F. FERRIER.

Geological Survey of Canada, Ottawa, Dec. 27.

AMONG THE PUBLISHERS.

THE current number of *The Illustrated American* gives an interesting article from its special correspondent about the Indian troubles, illustrated with portraits of Gen. Miles and Sitting Bull, and scenes in and around the Pine Ridge Agency.

—*Babyhood* begins the new year with every appearance of prosperity. In its January number are "Home Gymnastics for Young Children," by Dr. Mary Taylor Bissell; and "Mumps," by the editor, Dr. Yale. In the department of home instruction, to which *Babyhood* pays much attention, we find an article on "The First Month in French," which is an illustration of a method of teaching young children a foreign language. The author is Mr. Louis Heilprin.

—The next number of the *Publications of the American Academy of Political and Social Science* will be distinctly a foreign one. Three of the leading articles are by foreign scholars. The first, by the eminent *savant* Professor Boehm-Bawerk, on the Austrian economists, contains an account of the recent work in economics by the new school in Austria. Professor Ritchie of Oxford (England), and Professor Ashley of Toronto (Canada), also contribute valuable articles. The most interesting feature of the number, however, is an account of the reform in railway rates in Austria.

CALENDAR OF SOCIETIES.

Philosophical Society, Washington.

Jan. 3 —G. E. Curtis, The Hot Winds of the Plains; O. T. Mason, The Study of Religions by the Methods of Natural History; J. Elfresh Watkins, The Log of the "Savannah," a Pioneer Trans-Atlantic Steamship.

New York Academy of Sciences.

Jan. 5.—George F. Kunz, The Discovery of Opal in Basalt near Moscow, Idaho, and Whelan, Washington; The Discovery of Diamond in Wisconsin, and a Description of the Floyd County, Va., Meteorite; mineralogical notes by other members.

Boston Society of Natural History.

Jan. 7.—J. G. Owens, A Few Games of the Zuñi Indians.

Royal Meteorological Society, London.

Dec. 17.—R. H. Scott, F.R.S., Note on a Lightning-Stroke presenting some Features of Interest; A. Brewin, Note on the Effect of Lightning on a Dwelling-House; M. W. C. Hepworth, Wind Systems and Trade Routes between the Cape of Good Hope and Australia; E. Mawley, Report on the Phenological Observations for 1890; W. Doberck, The Climate of Hong Kong.

Publications received at Editor's Office, Dec. 15, 1890–Jan 3, 1891.

ATLAS Vidal-Lablache. Histoire et Géographie. Part I. Paris, Colin & Cie. 6 maps. f°.

BACTERIOLOGICAL World, The. Vol. I. No. 1. January, 1891. Ed. by Paul Paquin, M.D. Columbia, Mo., Bacteriological World Co. 56 p. 8°. $3 per year.

CHAMBERS'S ENCYCLOPÆDIA. New ed. Vol. VI. Humber to Malta. Philadelphia, Lippincott. 828 p. 4°. $3.

CHESTER, F. D. The Gabbros and Associated Rocks in Delaware. (Bull. U. S. Geol. Surv., No. 59.) Washington, Government. 45 p. 8°.

CLARKE, F. W. Report of Work done in the Division of Chemistry and Physics mainly during the Fiscal Year 1887-88. Washington, Government. 174 p. 8°.

—— Same. 1888-89. Washington, Government. 60 p. 8°.

COKE Iron Manufactures, Report of Committee upon, for the City of Marquette, Mich., Oct. 6, 1890. Marquette, Mich., Mining Journal Co. 8 p. 8°.

COY, E. G. Greek for Beginners. New York, Cincinnati, and Chicago, Amer. Book Co. 152 p. 12°. $1.

DAY, D. T. Mineral Resources of the United States. 1888. Washington, Government. 652 p. 8°.

DREYER, J. L. E. Tycho Brahe. Edinburgh, Black. 405 p. 8°. (New York, Macmillan, $3.50.)

EDUCATIONAL Review. Vol. 1. No. 1. *m.* Ed. by Nicholas Murray Butler, Ph.D. New York, Holt. 104 p. 8°. $3 per year.

ENGLISH Prose, Selections in, from Elizabeth to Victoria (1580–1880). Chosen and arranged by James M. Garnett, M.A. Boston, Ginn. 701 p. 12°. $1.65.

FOWLER, H. N., *ed.* Q. Curti Rufi Historiarum Alexandri Magni Macedonis. Libri III. et IV. Boston, Ginn. 96 p. 12°. 35 cents.

GARRISON, W. P. Good-night Poetry. (Bedside Poetry.) Boston, Ginn. 143 p. 16°. 75 cents.

GILBERT, G. K. Lake Bonneville. Washington, Government. 438 p. 4°.

GOLDTHWAITE'S Geographical Magazine. Vol I. No. 1. *m.* New York, W. M. & J. C. Goldthwaite. 85 p. 4°. $2 per year.

IDDINGS, J. P. On a Group of Volcanic Rocks from the Tewan Mountains, New Mexico, and on the Occurrence of Primary Quartz in Certain Basalts. Washington, Government. 34 p. 8°.

JOUY, P. L. The Collection of Korean Mortuary Pottery in the United States National Museum. Washington, Government. 8 p. 8°.

LAZENBY, W. R., and WERNER, W. C. Supplementary List to the Plants of Ohio, preliminary to a Complete Catalogue of the Flora of the State. Columbus, Ohio State Univ. 10 p. 8°.

MACLEAN, J. P. An Historical, Archæological and Geological Examination of Fingal's Cave, in the Island of Staffa. Cincinnati, Robert Clarke & Co. 49 p. 8°. 75 cents.

MELVILLE, W. H., and Lindgren, W. Contributions to the Mineralogy of the Pacific Coast. Washington, Government. 40 p. 8°.

NEW JERSEY, Final Report of the State Geologist of. Vol. II. Mineralogy, Botany, Zoölogy. Part 2. Zoölogy. Trenton, State. 824 p. 8°.

NIBLACK, A. P. The Coast Indians of Southern Alaska and Northern British Columbia. Washington, Government. 156 p. 8°.

OPEN Sesame! Poetry and Prose for School-Days. Vol. II. Ed. by Blanche Wilder Bellamy and Maud Wilder Goodwin. Boston, Ginn. 376 p. 12°. 90 cents.

—— Same. Vol. III. Boston, Ginn. 361 p. 12°. 90 cents.

WHITE, G. Sketch of the Philosophy of American Literature. Boston, Ginn. 66 p. 12°.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the 'Want' inserted under this head FREE OF COST, *if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.*

WANTED.—A situation in a scientific house by a graduate of the scientific department of the Jersey City High School as Geologist, Mineralogist or as assistant teacher in Physics or assistant to a chemist. Best of references. E. W. PERRY, 582 Third Street, Jersey City, N. J.

A UNIVERSITY GRADUATE IN SCIENCE, at present a junior student in medicine at the University of Michigan, desires a position as teacher or laboratory assistant. Special preparation in Zoology, Histology, Physiology and Human Anatomy. Will also teach, if desired, Physics, Chemistry, Botany, Entomology, Embryology, Bacteriology and Sanitary Science. References and full particulars on application. H. B., 20 East Jefferson St., Ann Arbor, Mich.

WANTED.—A young man wishes a position as instructor in the sciences in some school or college. Chemistry a specialty. Would like to hear of some position with a private or manufacturing chemist, in which his knowledge of chemistry would help him. Address E. E. TOWNE, B.A., 272 Worthington St., Springfield, Mass.

WANTED.—An Exploring Expedition, backed by $15,000, will be sent into Alaska and the British Northwest Territory the coming year, to be gone one or two seasons. A scientist or two will more than likely be taken along. Applications from such will be gladly received and carefully considered. To assist in making these applications the commander would say that he considers a full practical knowledge of mineralogy and geology necessary, and if the applicant can add the duties of botanist, ethnologist, or any other of the sciences, and photography, sketching, medicine and surgery, or other useful arts for exploring, it will add to the chances of being selected. Applicants must be physically perfect, and ought to be about medium age. One of these scientists will be the second in command of the party. Any credentials forwarded for consideration will be returned, if requested, after consideration. Address "ALASKA," care of *Science*.

WANTED.—There being a considerable annual income for the purchase of books for the Museum Reference Library of Iowa College, it is desirable to have at hand any and all circulars, specimen sheets, catalogues, etc., of all works on Natural History in general, both foreign and domestic. Circulars of museum supplies, apparatus, etc., etc., desired also. State terms. Address ERWIN H. BARBOUR, Box 1333, Grinnell, Iowa.

WANTED.—A situation as Analytical Chemist is desired by the assistant of the late noted scientist, Dr. Cook, during his 15 years survey of the State of New Jersey. Highest testimonials furnished. Address Prof. EDWIN H. BOGARDUS, New Brunswick, P, O. Box 224, care Prof. F. C. Van Dyck.

COULD some one inform me what the ingredients and origin of asphalt as used for street-paving and gathered at Trinidad are? Also how gathered and shipped by natives, and mode of refining by the Warren-Scharf Co. of New York and the Barber Co. of Washington? G. KNIPER, 28 Gunn Block, Grand Rapids, Mich.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 47 Lafayette Place, New York.]

I wish to exchange Eastern *Lepidoptera* for those that I do not have, particularly those found in the South. Jos. F. Crandall, Honesdale, Wayne Co., Pa.

To exchange, 1890 Seeger and Guernsey Cyclopedia, containing a complete list of the manufactures and products of the U. S., and address of first hands, cost $6. David R. Lewis, Saybrook, Ill.

For exchange—Nice specimens of Unios alatus, trigonus, parvus, occidens, anadontoides gibbosus, rectus, verucosus, gracilis coccineus, ventricasus, multiplicatus and plicatus cornutus. Margaritana confrogosa, complanata, rugosa. Anadonta edentula, decora, corpulenta, and about 300 of the beautiful Ana. suborbiculata. Wanted: Unios from all parts of the world, and sea-shells. Address Dr. W. S. Strode, Bernadotte, Ill.